## Environmental Horticulture Science

# CDE

# Meets the UC “g” Admission Requirement

**Approved 2003**

1. **COURSE INFORMATION:**

**Course Title:** Environmental Horticulture Science

**Length of Course:**  One Year

**Grade Level:** 11-12

**Required or Elective:** Elective – meets science related graduation requirements and meets the UC “g” admission requirement

**Prerequisites:** Algebra I

1. **MAJOR GOAL AND STUDENT OUTCOMES:**

A. This course will provide the student with theories and principles related to environmental horticulture science. This course is intended to successfully prepare those students who plan on majoring in agricultural sciences at a four-year college and/or university. Specific student outcomes are:

1. Utilize Environmental Horticulture Science principles as a relevant vehicle to teach biological principles and improve the science principles and scientific literacy of students.

2. Integrate mathematic standards, Language Arts, and science principles into an academically rigorous course that increases the student’s capacity to think analytically, problem solve, and utilize effective research practices.

1. COURSE OBJECTIVES:

A. The course objectives are as follows:

1. To develop an appreciation of horticulture.

2. To incorporate scientific methods and biological principles with modern agricultural practices.

3. To create an awareness of the importance of horticulture.

4. To prepare students for college level entry in the various disciplines of horticulture.

5. To understand the importance of plants, their uses, and incorporation of plants in our society.

6. To be familiar with cell theory and its application to the organization of all organisms.

7. To recognize plant physiology, growth requirements, and nutrients needed for optimum plant growth.

8. To recognize the diversity of life and the interrelationships among all organisms

9. To understand the role of plants in our landscape, the process of design, installation, and maintenance of those plant materials.

10. To be aware of the historical and descriptive nature of horticulture as a science.

1. To acquire agricultural and biological vocabulary, and the

reading, writing and critical thinking skills pertaining to the science.

**IV. COURSE OUTLINE:**

1. Agricultural Effects of Environmental Ecology
2. Categories and sources of pollution
3. Conserving natural and water resources
4. Agricultural practices beneficial and harmful to the environment
5. Chemical erosion & physical properties
6. Ecosystems
7. The Nitrogen Cycle
8. The Carbon Cycle
9. Water Cycle
10. Plant Reproduction

1. Asexual reproduction

2. Sexual reproduction

1. Nature of Life
2. Attributes of living organisms
3. Chemical and physical bases of plant life
4. Chemical components of protoplasm
5. Plant Physiology and Growth
6. Function of plant cells
7. Examination of cell wall and function
8. Cellular reproduction
9. DNA, RNA, and synthesis of proteins
10. Introduction of root, stem, and leaf structures and functions
11. Plant growth requirements
12. Environmental factors on growth
13. Specialized roots, stems, and leaves
14. Requirements for seed germination
15. Plant hormones
16. Phytochrome
17. Photoperiodism
18. Environmental modifications for growth
19. Managing plant growth
20. Plant Pathology and Entomology
21. Common diseases
22. Effect on development and growth
23. Method of controls
24. Orders of Insects
25. Insect structure and development
26. IPM practices
27. Biotechnology Applications in Environmental Horticulture
28. Biotechnology
29. Molecular biotechnology: genetic importance
30. Genetic engineering
31. Tissue culture
32. Soil Structure and Function
33. Components, function, economic uses, and relationship to the earth
34. Geologic Cycle
35. Chemical and physical weathering
36. Soil formation
37. Plant Nutrients
38. Primary, secondary, and micro-nutrients
39. Function of nutrients in plant growth
40. Nutrient deficiencies & symptoms
41. PH requirements and effects on plant life
42. Nitrogen fixation and absorption
43. Modifying growth
44. Plant Names and Classifications
45. Development of the biomial system of nomenclature
46. Development of kingdom concept
47. Classification of major groups of plants
48. Synoptic key to major groups of plants
49. Introduction to Seed Plants: Gymnosperms
50. Human and ecological relevance of gymnosperms
51. Examination of four major divisions of gymnosperms
52. History of gymnosperms
53. Flowering Plants
54. Structure and reproduction of flowering plants
55. Trends of specialization and classification in flowering plants
56. Division Anthophyta
57. Plant preservation
58. Fruits and Seeds
59. Kinds of fruits
60. Fruit and seed dispersal
61. Seed structure
62. Longevity of seeds & fruits
63. Plants and Civilizations
64. Origin of cultivated plants
65. Selected families of flowering plants
66. Agricultural and urban environment influence
67. Multiculturalism and plants
68. Ethno-botany
69. Pioneers of plants & civilizations
70. Plant Research Project
71. Development of environmental horticulture science projects
72. Statistical management of project via Record Book
73. Instructional coordination and supervision
74. Analysis of project results
75. Professional Opportunities in Environmental Horticulture Science

1. Biotechnology & research fields

2. Other related horticulture science fields

 P. Agricultural Inter-Personal & Leadership Development

1. Completion of a Supervised Agricultural Experience Program and data collection

2. Development of listening, speaking, writing & reading skill activities

3. Critical thinking & group team building activities

4. Agriculture presentations

**V. TEXTS & SUPPLEMENTAL INSTRUCTIONAL RESOURCES:**

Stern, K (1998). Plant Biology – 5th Edition, Wm. C. Brown Publishing, NY, NY.

Arms. K (1996). Environmental Science, Harcourt Brace & Company, Orlando, Florida.

Schroeder, C., Seagle, E. & Felton, L. (2003). Horticulture – 4th Edition, Prentice Hall

 Interstate, Upper Saddle River, New Jersey.

University of California, Davis & California Department of Education (1991). Agriculture Model Curriculum Lesson Plans for Ornamental Horticulture. CDE Press. Sacramento, CA.

Items listed below are commonly used as supplementary materials and are coordinated with the adopted course objectives:

CDE Biological Science Content Standards

Research Handouts

Videos

 DVD's

 Internet

**VI. KEY ASSIGNMENTS:**

1. Research Paper on Environmental Horticulture
2. Seminar Presentation on Horticulture Science Practices
3. Development of Science Fair Project relating to Environmental Horticulture
4. Laboratory activities
5. Supervised Agricultural Experience Project & Record Book
6. FFA Leadership Participation

**VII. INSTRUCTIONAL METHODS:**

1. Lecture
2. Audio Visual Materials
3. Research Readings and Written Presentations
4. Homework Assignments
5. Group & Individual Activities
6. Laboratory Investigation – 1 per week (20% of grade)
7. Discussion & Group Dynamics
8. Quizzes, Tests & Final Exam
9. Guest Speakers
10. Field Trips
11. Internet Exploration
12. Seminar Presentation

**VIII.** **ASSESSMENT METHODS:**

A. Quizzes, Tests & Final Exam 40%

B. Laboratory Investigation & Write-ups 20%

C. Writing Assignments 10%

D. Leadership & Critical Thinking Activities 10%

E. Research report and seminar presentation 10%

F. Supervised Agricultural Experience Project & Record Book 10%

**IX. LABORATORY ACTIVITIES:**

 A. The Scientific Method

 B. Analyzing Ecosystems

 C. Checking water for Coliform Bacteria

 D. Genotypic and phenotypic ratios

 E. Cell identification

 F. Flower dissection and pollen growth germination

 G. Secondary and microelements with N-P-K tissue tests on plants

 H. Water germination test

 I. Cold germination test

 J. Determining salt tolerance

 K. Factors affecting photosynthesis

 L. Effects of leaf surface area, air movement, and light on transpiration rates

1. Effects of light quality on plant growth
2. Geotropism
3. Phototropism
4. The Hydrologic Cycle
5. Comparison of soil vs. non-soil plant culture
6. Effects of nutrient concentrations on hydroponics plant growth
7. Effects of chemicals (herbicides) on plants
8. Herbicide biopsy
9. Effects of rooting hormone on root development
10. Effects of gibbarellic acid on seed germination
11. Anther culture
12. DNA extraction
13. Probability of trait inheritance
14. Tissue culture
15. Seed dispersal
16. Genetic probability
17. Insect identification
18. Environmental forcing structures

EE. Comparison of asexual propagation methods

1. Water quality
2. Plant pigment chromatography